



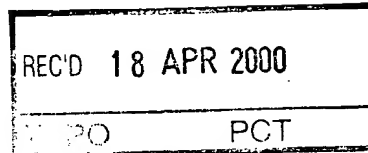
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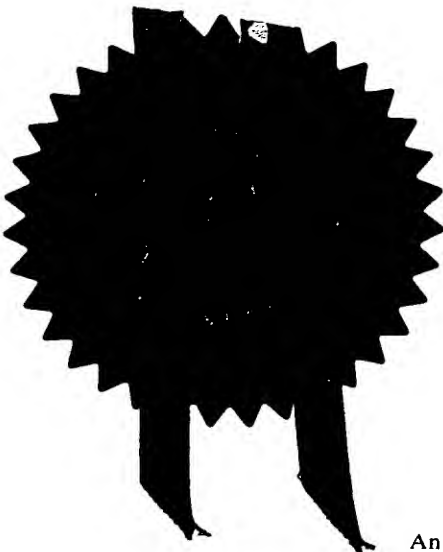
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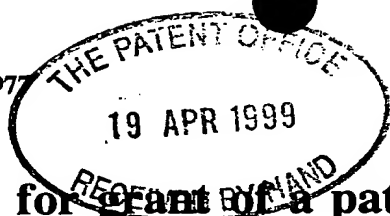
P. Mahoney

Dated 6th April 2000



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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
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1. Your reference

PJF10078GB

2. Patent application number

(The Patent Office will fill in this part)

Filed Herewith

9908923.7

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Cromptons Leisure Machines Limited
4 Wilton Road
Haine Industrial Estate
Ramsgate
Kent, CT12 5HG
England

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

England

6056848001

4. Title of the invention

ARTICLE HOLDING APPARATUS

5. Name of your agent (if you have one)

Elkington and Fife

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Elkington and Fife
Prospect House
8 Pembroke Road
Sevenoaks
Kent
TN13 1XR

Patents ADP number (if you know it)

67004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of Filing
(day/month/year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of Filing
(day/month/year)

Patents Form 1/77

Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer "Yes" if:

YES

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d))

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	0
Description	8 /
Claim(s)	3 / <i>PR</i>
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Priority documents	0
Translations of priority documents	0
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	0
Request for preliminary examination and search (Patents Form 9/77)	1 / <i>PR</i>
Request for substantive examination (Patents Form 10/77)	1 /
Any other documents (please specify)	0

11.

I/We request the grant of a patent on the basis of this application.

Signature

Peter Finnie

Date

19.4.99

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr Peter Finnie
0171 405 3505

ARTICLE HOLDING APPARATUS

This invention relates to an article holding apparatus, in particular as part of an amusement machine.

5

In one known amusement machine, a rotatable horizontal playfield is provided with an array of target areas onto which coins or tokens are projected as the playfield rotates. A "win" occurs when a coin is detected on one of the target areas. Sensors detect the coins and the position is determined with respect to a number of marks on the side edge of the playfield which are detected by an optical sensor. If a coin is sensed to be within the circumferential limits of a target area then a win is recorded and the appropriate score or payout is awarded.

The position encoding system in this known arrangement is limited in that it requires the target areas to be radially aligned to correspond to the circumferentially spaced positioning marks. Since there has to be a regular array of target areas it is not possible to introduce much variation into the graphic design of the playfield to make the game more challenging and interesting as this is to some extent dictated by the positions of the target areas.

20

According to the present invention, an article holding apparatus comprises a surface defining a target field having an array of target areas at positions on the target field and a position encoder having a number of sensors, the target field and the or each sensor being adapted for relative movement to one another so that articles introduced

onto the target field can be detected by a sensor, wherein the position encoder maintains a cyclical count and is arranged to determine whether or not an article detected by a sensor is within a target area on the target field with reference to a count value held by a counter.

5

Preferably, the position encoder comprises a microprocessor which maintains the count and has an associated memory device which stores a look-up table for mapping count values to target field position for use in determining whether or not an article detected by a sensor falls within one of the target areas on the target field.

10

Preferably, the or each sensor is associated with at least one dedicated look-up table which defines the circumferential limits of each target area capable of passing within the detection field of the sensor with respect to count value.

15 Preferably, the microprocessor is arranged to apply a correction factor when determining the position of an article on the target field with reference to a look-up table to compensate for any variation in the speed of the relative movement between the target field and the or each sensor over time.

20 Preferably, the position encoder counter is reset periodically in dependence on the relative positions of the target field and the or each sensor.

Preferably, the or each sensor is an inductive field-type sensor.

The article holding apparatus is preferably part of an amusement machine, in particular one which includes a horizontal playfield. The articles on the surface are preferably playing pieces, such as coins or tokens. In this context, the target areas may represent zones onto which a person must aim to project the playing pieces in order to win, the win value being determined with respect to a stored set of game rules.

The relative movement between the surface and the or each sensor may be achieved by a combination of a movable playfield with one or more static sensors, or a static playfield with one or more movable sensors. Alternatively, the playfield and the or each sensor may be movable. In one preferred embodiment, the surface comprises a rotatable horizontal playfield with at least two radially spaced sensors. Preferably, there are at least two, and more preferably four, equally circumferentially spaced sets of radially spaced sensors.

The present invention provides an accurate way of determining the positions of coins or tokens on a playfield forming part of an amusement machine, where legal requirements dictate that wins must be properly recognised before a machine will be issued with the necessary gaming licence.

An example of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a simplified schematic view of a target field for an amusement machine

having an array of target areas; and,

Figure 2 is a block diagram of a game control system associated with a position encoder used to determine the position of articles introduced onto the target field.

5

Figure 1 shows a circular horizontal playfield 1 which rotates in the direction shown by the arrow A. The playfield 1 defines a target field having an array of marked areas 6, which form a part of a game associated with an amusement machine (not shown). In the course of the game, coins are projected onto the playfield. Some of the target areas have apertures 2 which are machined into the playfield. The target areas are spaced along four different circular band on the playfield.

A fixed metal chassis 3 is positioned above the playfield 1 and divides the playfield into four equal quadrants. The chassis 3 supports four equally spaced radial sweeper arms 4. The chassis 3 floats immediately above the playfield by means of fixings in the centre and circumference of the playfield, thus allowing the playfield to rotate freely. Fixed to each limb of the chassis is a sweeper arm 4 which is shaped to form four U- or V- shaped indentations 7 in the leading surface (with respect to relative movement between the playfield 1 and chassis 3). The indentations are positioned such that the apexes 8 pass directly over respective apertures 2 in the playfield. Thus the apexes of the four indentations correspond respectively to four circular tracks along which the target areas (and apertures) are positioned. Each indentation has a shallow sloping side 9 closer to the centre of the playfield, and a steeper sloping side 10 further from the centre point of the playfield. Together with the rotary movement

of the playfield, this helps to direct the coins towards the apex. Coins on the playfield are thus swept by the movement of the playfield into the indentations until they reach the apex, and the coins then fall through the apertures as the apex passes over the apertures. Each circular track has one aperture in each of the four
5 quadrants. Coins on the playfield are thus cleared.

Inductive field-type sensors 5 are attached to the chassis 3 so as to sense coins and provide a signal to a game control system shown in Figure 2. The apparatus includes an optical sensor 11 on one arm which is positioned to detect each of four equally
10 circumferentially spaced marks 17 provided on the edge of the playfield 1 as they pass by the optical sensor 11 and output a signal to the control system shown in Figure 2.

The game control system shown in Figure 2 is centred around a microprocessor 12
15 having an associated memory store 13. Any form of processor is suitable. The memory store 13 holds computer executable instructions for operating the amusement machine together with a number of look-up tables used in determining the position of the coin on the playfield, and in particular, whether or not a detected coin lies within one of the marked target areas. Microprocessor 12 receives signals from each
20 of the four induction sensors 5 provided on each of the four arms 4 of the chassis 3 together with signals from the optical sensor 11. The microprocessor 12 maintains an internal counter which is reset periodically in dependence on the output of the optical sensor 11. The microprocessor 12 is also associated with a coin entry validation unit 14, a game display 15, and a payout dispensing unit 16.

In use, coins which are projected onto a quadrant of the playfield 1 are detected by one of the sensors 5 on the respective arm 4 of the chassis 3. As the leading edge of the coin passes into the detection envelope of a sensor 5 the sensor outputs a logic low value and maintains this until the trailing edge of the coin passes outside the
5 detection envelope. The microprocessor 12 is arranged to detect the rising edge of the pulse generated by the sensor 5 and record the current count value held by the internal counter maintained by the microprocessor. In order to determine whether or not the detected coin is within a winning target area, the microprocessor 12 accesses a look-up table held in the memory store 13 to check if the count value falls within
10 the limits of one of the possible target areas on the circular band associated with the sensor. If it does, then a win is recorded, the value being determined with reference to the particular target area identified by the look-up table. In this example, there are four different look-up tables, one for each band of the playfield, defining the target areas in each band.

15

In this example, the playfield 1 is assumed to take a count of 3150 interrupts of the microprocessor clock cycle to rotate through 90° i.e. one complete quadrant. Whilst in some circumstances it may be acceptable to map the count value directly to the corresponding entry in the appropriate look-up table when a coin is detected, this is
20 not the case when used in gaming machines, since variations in the rotational speed of the playfield (which is independent of the microprocessor interrupt cycle) can give rise to errors. In the present invention, these errors can be compensated for by applying a speed correction factor which takes into account the average rotational speed of the playfield 1.

In the game control system shown in Figure 2, the count maintained by the microprocessor 12 is only reset when the microprocessor detects an output from the optical sensor 11. Variations in rotational speed mean that a count value may be less than or greater than 3150 at the time of reset. If the count value exceeds a
 5 predetermined maximum value (say 4000), the machine enters an alarm mode and the game stops.

To correctly map the count value recorded when a coin is detected to the correct position in the look-up table, a logic algorithm is applied by the microprocessor so
 10 that a win is detected when the following is satisfied:

IF (count_value \geq (start_bit x (average_count/3150)))

AND (count_value \leq (stop_bit x (average_count/3150)))

15 where:

count-value is the current count value on the playfield at the time the coin is detected;

start_bit and stop_bit are values in the look-up table defining the circumferential limits of a winning target area identified in the look-up table with respect to the direction of rotation of the playfield;

20 average_count is the average number of counts taken to traverse each quadrant; and
 3150 is the length of the look-up table.

An example of look-up table having seven target areas is shown below in Table 1.

Table 1

	#define r1_b1_st	0.0
5	#define r1_b1_stp	0.0
	#define r1_b2_st	426.0
	#define r1_b2_stp	656.0
	#define r1_b3_st	879.0
	#define r1_b3_stp	1108.0
10	#define r1_b4_st	1331.0
	#define r1_b4_stp	1562.0
	#define r1_b5_st	1785.0
	#define r1_b5_stp	2015.0
	#define r1_b6_st	2239.0
15	#define r1_b6_stp	2468.0
	#define r1_b7_st	2962.0
	#define r1_b7_stp	2921.0

20 The present invention provides an accurate position encoder for determining the position of coins or tokens on the playfield. Indeed, the resolution at the innermost band of target areas is around 0.15 mm whilst the resolution at the outermost band of target areas only reduces to a figure of around 0.29 mm, each of which is sufficient to meet the requirements of the various gaming laws found Internationally.

CLAIMS:

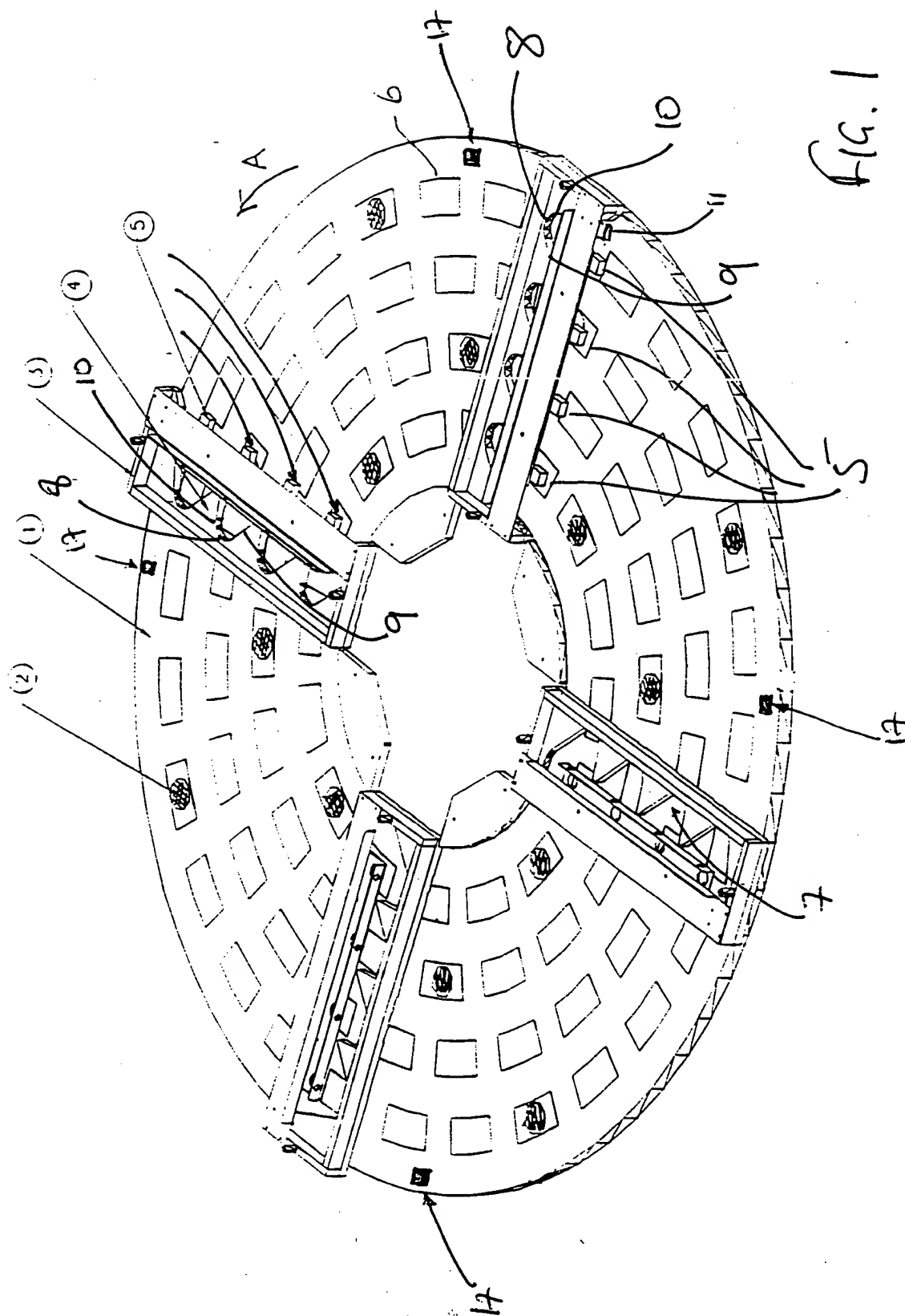
1. An article holding apparatus comprising a surface defining a target field having an array of target areas at positions on the target field and a position encoder
5 having a number of sensors, the target field and the or each sensor being adapted for relative movement to one another so that articles introduced onto the target field can be detected by a sensor, wherein the position encoder maintains a cyclical count and is arranged to determine whether or not an article detected by a sensor is within a target area on the target field with reference to a count value held by a counter.
10
2. An apparatus according to claim 1, in which the position encoder comprises a processor which maintains the count and has an associated memory which stores a look-up table for mapping count values to target field position for use in determining whether or not an article detected by a sensor falls within one of the
15 target areas on the target field.
3. An apparatus according to claim 2, in which the processor is arranged to apply a correction factor when determining the position of an article on the target field with reference to a look-up table to compensate for any variation in the speed
20 of the relative movement between the target field and the or each sensor over time.
4. An apparatus according to any preceding claim, in which the or each sensor is associated with at least one dedicated look-up table which defines the circumferential limits of each target area capable of passing within the detection field

of the sensor with respect to count value.

5. An apparatus according to any preceding claim, in which the position encoder counter is reset periodically in dependence on the relative positions of the target field and the or each sensor.
6. An apparatus according to any preceding claim, in which the or each sensor is an inductive field-type sensor.
- 10 7. An apparatus according to any preceding claim, in which the relative movement between the surface and the or each sensor is achieved by a combination of a movably playfield with one or more static sensors.
8. An apparatus according to any of claims 1 to 6, in which the relative
15 movement between the surface and the or each sensor is achieved by a combination of a movable playfield with one or more movable sensors.
9. An apparatus according to any of claims 1 to 6, in which the relative movement between the surface and the or each sensor is achieved by a combination
20 of a static playfield with one or more movable sensors.
10. An apparatus according to any of claims 1 to 8, in which the surface comprises a rotatable playfield with at least two radially spaced sensors.

11. An apparatus according to claim 10, in which there are at least two equally circumferentially spaced sets of radially spaced sensors.
12. An amusement machine comprising an article holding apparatus
5 according to any preceding claim.
13. An apparatus substantially as shown in and/or described with reference to any of Figures 1 and 2 of the accompanying drawings.

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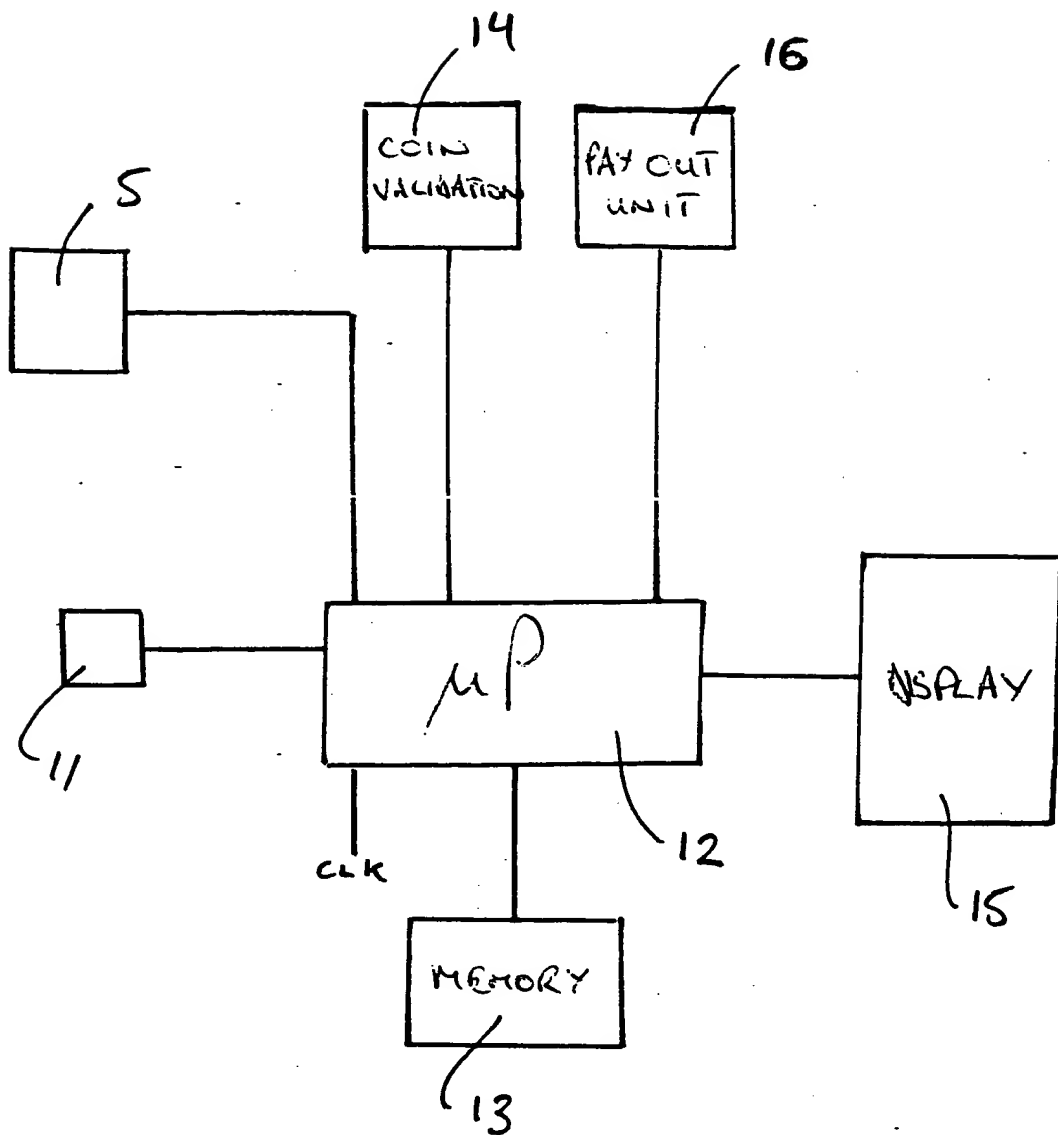


FIG. 2

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